

Noto Station Status Report

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Abstract General information about the Noto VLBI Station and the 32-m telescope is provided. The focus is on the current status and on hardware—software upgrades during the last two years of operations.

1 General Information

The 32-m parabolic antenna is located near Noto in Sicily and is operated by the Institute of Radioastronomy of the National Institute for Astrophysics (INAF). The telescope has been active since 1989 in VLBI observations and has regularly participated in geodetic observations, even during the COVID-19 pandemic. In the past, the antenna was also involved in many different projects of radioscience and Space VLBI. Currently, the telescope's core commitments are mainly related to both the EVN and IVS networks.

A permanent GNSS station (NOT1) is installed nearby and is part of the IGS network. The observatory is therefore a co-location geodetic site, contributing to the realization of the ITRF.

2 Current Status and Activities

- **Station** – We refurbished the station air cooling system completing several interventions and installing new chillers serving the offices and laboratories. In 2021 we also replaced the UPS

with a new one. A new IF distributor is being developed and installed in the control room. The device automates and facilitates receiver setup, allowing for better and more reliable setup before experiments. A full H-maser maintenance was finalized at the end of 2022.

- **Antenna** – The 32-m antenna is fully azimuth and elevation steerable and is equipped with an active surface, allowing it to correct gravitational deformations of the primary mirror. The configuration of primary or secondary focus is done automatically by a servo system that moves the secondary mirror and the primary focus receiver box. The servo system, together with several mechanical parts of the actuators, was replaced and refurbished recently.
- **Receivers** – The primary focus receiver is an L- (1.316–1.745 GHz), S- (2.213–2.389 GHz), and X-band (8.205–8.938 GHz) system. Available secondary focus receivers are Clow- (4.62–5.02 GHz), Chigh- (5.1–7.25 GHz), and K-band (21.7–22.2 GHz). All receivers provide double, circular polarization. Clow- and K-band are cryogenics systems. Presently Chigh- and K-band have a failure in one of their IF chains (LNA). A simultaneous three-band (K, Q, W) receiver (18–26 GHz, 34–50 GHz, and 80–116 GHz) is now available and ready to be installed in the secondary focus cabin. The receiver was funded by the PON (National Operational Program) issued by the Italian Research Ministry. It can output wide IF bandwidths (K-band: 8 GHz; Q-band: 16 GHz, and W-band: 16 + 16 GHz). The final installation and commissioning of the receiver will be done in 2023, after the refurbishment of the secondary focus cabin, including the new helium line, is completed.

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Fig. 1 The Noto antenna in a recent image.

- **VLBI back-end** – Noto is currently running a DBBC version 2. The firmware version is currently DDC V107 and DFB V16. The recorder is a Flexbuff system (software version 2.8.1). The Flexbuff system of Noto has a capacity of 360 TB. Also in 2022 we completed the purchase of a new, state-of-the-art Flexbuff with a capacity of 512 TB. In the framework of the PON we also managed to buy a new DBBC, version 3 (up to six IFs).

3 Geodetic VLBI Observations

Noto participated in 46 geodetic sessions (23 in 2021 and 23 in 2022): 37 IVS-R1, five IVS-CRF, and four IVS-T2 experiments.

4 Future Plans

A complete refurbishment of the secondary focus cabin (Vertex Room), the cooling system of the telescope, the helium pipes, and the power plant serving the telescope was funded by the INAF and will be done in 2023. The INAF has succeeded in a call for funding under the framework of the PNRR (EU fundings). As part of the PNRR, Noto will go through several major maintenances in the next three years. The azimuth rail, including the wheels and bearing, the elevation rack, and the secondary mirror will be replaced. Also the telescope structure coating and the primary mirror painting will be completely refurbished.